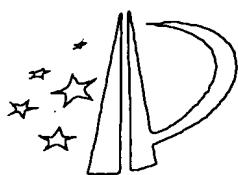


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[54] 发明名称 一种计算机网络上存储介质资源的
聚集方法

[57] 摘要

本发明公开了一种计算机网络上存储介质资源的聚集方法，包括以下步骤：a) 将网络上的具有闲置空间的各存储介质资源在一台联网的计算机上以存储介质资源列表的结构进行注册，形成一个虚拟的存储介质聚合体，该计算机存储介质资源管理中心；b) 将需要存储的文件拷贝到存储介质聚合体上，存储介质资源管理中心根据存储的文件将该文件存储在本地或对该文件进行裁剪并设置文件属性信息，裁剪后把该文件内容迁移到网络上相应的注册存储介质上，同时在本地保留一个仅包含文件属性信息文件副本；c) 根据文件裁剪时设置的文件属性信息对存储介质资源的存储文件进行相应的访问。本发明能集中管理网络上存储介质资源，提高存储介质资源的利用率，并且降低存储成本。

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Abstract

The present invention discloses a method aggregating storage medium resources in a computer network, and its steps are: a) Registering the storage medium resources, which are in a network and have available spaces, in a storage medium resources table structure on a host computer that is connected to the network to form a virtual storage medium aggregation, and the computer is the storage medium resource management center; b) Copying a file to be stored to the virtual storage medium aggregation and the storage medium resource management center stores the file, depending on the file, locally, or on a corresponding registered Storage Medium Resource after trimming the file and setting the file attribute information while at the same time saving a copy, which only includes the file attribute information locally; c) Accessing a file on a storage medium resources according to the file attribute information, which was set when the file was trimmed. The present invention, which centrally manages storage medium resources in a network, increases efficiency of usage of storage medium resources and reduces storage cost.

Claims

What is claimed is:

1. A method of aggregating storage medium resources (SMRs) in a network, comprising the steps of:

Registering the SMRs, which are in a network and have available spaces, in a SMR table structure on a host computer that is connected to the SMRs, wherein the contents of the SMR table are logic reflections of all SMRs that can be seen by users, forming a virtual storage medium aggregation (VSMA), and the said computer is the storage medium resources manage center (SMRMC) for users' direct access;

Copying a file to be stored to the VSMA of the SMRMC, wherein the VSMA stores the file, depending on the file, locally, or on a corresponding registered storage medium resource after trimming the file and setting the file attribute information while at the same time saving a copy, which only includes the file attribute information locally;

Accessing a file on a SMR according to the file attributes information on the SMRMC, which is set when the file is trimmed.

2. The method of aggregating storage medium resources in a network of Claim 1, wherein the SMR table structure comprises:

Name of the SMR, which is the name assigned by the system administrator for administrating a SMR in a network, is unique in the system and is in the SMR table to represent the SMR, wherein each SMR has a unique name, which is used by the system administrator to manage the SMR in the network;

Description of the SMR, which is used, for the administrator to distinguish each SMR, to describe the characteristics of the SMR or type of files to be stored on it;

Storage Path of the SMR, which is the network path to access SMRs, is used

to locate the SMR in the network and can be used by the user to access the data on the SMR, wherein the Storage Path of the SMR is formed as: the name of the host computer + the local path of the file;

Username and Password for accessing network resources, which are used to acquire permission of full control of the corresponding SMR;

Capacity of the SMR, which is the storage capacity of the object storage medium resource and is used by the system to assess whether a SMR has enough space left to store a particular file when it plans to move the file, wherein if the said SMR does not have enough space, the system will accordingly store the file on another SMR;

Type of the SMR, which is online, for transferring files, or offline, for backing up files, wherein online SMRs include disks, optical disks and array of disks;

Type of the network connection, which is 10/100M Ethernet, 1000M Ethernet, 155/622 ATM network, Wide Area Network, or other types of network connection, wherein the system chooses a SMR that has a faster connection speed first according to the types of network connections set by the system administrator, because network environment has a deep impact on the speed of accessing a file;

Available Space of the SMR, which is the current available space of a SMR and is automatically updated each time after a file is copied to the SMR;

Status of Resource Allocation, which is to show whether the SMR is allocated to a directory on the VSMA, wherein a SMR can only be allocated to one of the directories on the VSMA and the Status of Resource Allocation is changed to ALLOCATED after the administrator has allocated the SMR to a directory on the VSMA;

Number of times of access, which is the number of times the system has accessed the SMR;

Number of times of access failure, which is the number of times the system could not access the SMR due to some reasons while the ratio of number of times

of access failure to number of times of access represents the availability of the SMR;

Status of the SMR, which states whether the SMR is available.

3. The method of aggregating storage medium resources in a network of Claim 1, wherein the said file attribute information comprises:

File Flag of the system, which is the File Flag used by the operating system (OS) during file management and is maintained by the file system;

File Trimming Flag, which is used to indicate whether a file has been trimmed, wherein if the file has been trimmed, then the flag is set and otherwise the flag is 0;

Remote Access Flag, which is used to indicate the retrieval manner of a trimmed file, and is set by the system administrator or set by the system automatically according to rules set by the system administrator, wherein if the flag is set, a user is redirected to the location where a file is transferred, when the user is trying to access the file and otherwise, the system will copy the file from where it is to local disks;

Network Path Flag, which is used to indicate the location where the file is stored; and is valid only after the File Trimming Flag has been set.

4. The method of aggregating storage medium resources in a network of Claim 1, wherein the step of accessing the file on a SMR comprises the steps of: if the file is stored on the VSMA, then a user may access the file directly from local SMRs of the VSMA, wherein if the file attribute indicates the file has been trimmed, then the file is copied to the VSMA according to the network path recorded in the file data domain, then accessed by the user and if the file's Remote Access Flag has been set and the file is large, then the file is accessed remotely by the user without being copied to the local SMRs of the VSMA.

A Cyclic Training Sequence Generating Method, Communication System and Communication Method

Field of the Invention

The present invention relates to a method of aggregating storage medium resources in a network.

Background

Most contemporary computer storage systems are based on host computers, which are connected with disk arrays, optical disks and tapes. Each host computer controls its storage medium resources independently, and isolated "information islands", which are hard to manage, are formed. Moreover, because the actual usage rate of invested storage resources is low, much of the storage capacity is wasted. Data stored in storage resources in a network are shared, by users in the network, only by way of connecting devices in the network. As more and more data are stored in the network and network storage resources increase, the problem of how to manage data and use storage resources efficiently has become the hottest topic for network administrators.

Brief Description of the Invention

The present invention provides a method of aggregating storage medium resources in a network, of managing storage resources in the network centrally, of increasing usage rate of the storage medium resources and of saving storage cost.

The present invention includes the following steps:

Registering the SMRs, which are in a network and have available spaces, in a SMR table structure on a host computer that is connected to the SMRs, wherein the contents of the SMR table are logic reflections of all SMRs that can be seen by users, forming a virtual storage medium aggregation (VSMA), and the said computer is the storage medium resources manage center (SMRMC) for users' direct access;

Copying a file to be stored to the VSMA of the SMRMC, wherein the VSMA stores the file, depending on the file, locally, or on a corresponding registered storage medium resource after trimming the file and setting the file attribute information while at the same time saving a copy, which only includes the file attribute information locally;

Accessing a file on a SMR according to the file attributes information on the SMRMC, which is set when the file is trimmed.

The contents of the said SMR table include:

Name of the SMR, which is the name assigned by the system administrator for administrating a SMR in a network, is unique in the system and is in the SMR table to represent the SMR, wherein each SMR has a unique name, which is used by the system admnistrator to manage the SMR in the network;

Description of the SMR, which is used, for the administrator to distinguish each SMR, to describe the characteristics of the SMR or type of files to be stored on it;

Storage Path of the SMR, which is the network path to access SMRs, is used to locate the SMR in the network and can be used by the user to access the data on the SMR, wherein the Storage Path of the SMR is formed as: the name of the host computer + the local path of the file;

Username and Password for accessing network resources, which are used to acquire permission of full control of the corresponding SMR;

Capacity of the SMR, which is the storage capacity of the object storage medium resource and is used by the system to assess whether a SMR has enough space left to store a particular file when it plans to move the file, wherein if the said SMR does not have enough space, the system will accordingly store the file on another SMR;

Type of the SMR, which is online, for transferring files, or offline, for backing up files, wherein online SMRs include disks, optical disks and array of disks;

Type of the network connection, which is 10/100M Ethernet, 1000M Ethernet, 155/622 ATM network, Wide Area Network, or other types of network connection, wherein the system chooses a SMR that has a faster connection speed first according to the types of network connections set by the system administrator, because network environment has a deep impact on the speed of accessing a file;

Available Space of the SMR, which is the current available space of a SMR and is automatically updated each time after a file is copied to the SMR;

Status of Resource Allocation, which is to show whether the SMR is allocated to a directory on the VSMA, wherein a SMR can only be allocated to one of the directories on the VSMA and the Status of Resource Allocation is changed to ALLOCATED after the administrator has allocated the SMR to a directory on the VSMA;

Number of times of access, which is the number of times the system has accessed the SMR;

Number of times of access failure, which is the number of times the system could not access the SMR due to some reasons while the ratio of number of times of access failure to number of times of access represents the availability of the SMR;

Status of the SMR, which states whether the SMR is available.

File attribute information includes:

File Flag of the system, which is the File Flag used by the operating system (OS) during file management and is maintained by the file system;

File Trimming Flag, which is used to indicate whether a file has been trimmed, wherein if the file has been trimmed, then the flag is set and otherwise the flag is 0;

Remote Access Flag, which is used to indicate the retrieval manner of a trimmed file, and is set by the system administrator or set by the system automatically according to rules set by the system administrator, wherein if the flag is set, a user is redirected to the location where a file is transferred, when the

user is trying to access the file and otherwise, the system will copy the file from where it is to local disks;

Network Path Flag, which is used to indicate the location where the file is stored; and is valid only after the File Trimming Flag has been set.

The detailed steps for accessing a file in the present invention are: if the file is stored on the VSMA , then a user may access the file directly from local SMRs of the VSMA, wherein if the file attribute indicates the file has been trimmed, then the file is copied to the VSMA according to the network path recorded in the file data domain, then accessed by the user and if the file's Remote Access Flag has been set and the file is large, then the file is accessed remotely by the user without being copied to the local SMRs of the VSMA.

The present invention has the following advantages:

1. Hierarchical storage function: because different SMRs vary in performance, capacity and storage cost per unit, SMRs could be divided into 3 levels according to their characteristics. In the present invention, the first level is online storage, i.e., local disks, for storing frequently accessed data. The second level is neighboring storage, which includes all the disks in a network registered on the SMRMC, for storing data which are to be accessed in a lower frequency. The third level is offline storage, i.e., tape machines, for storing historical data which are rarely used. The system administrator may set rules for allocating different types of files to different SMRs.
- 2 Centrally managed SMRs: in the present invention, all the SMRs are centrally managed at the SMRMC. The SMRMC configures and manages the SMRs within the network. The system administrator can add new resources according to the demand of the system, and set control permissions of different SMRs for different users. By supporting hybrid structures of storage environment, the system allows users to extend the capacity of SMRs by adding storage equipment with the best performance price ratio. A centralized control platform, which provides a graphic user interface for easy operations, is used to manage the SMRs and their capacity.
3. Exploiting the existing SMRs: in a traditional storage environment, each

computer or server has its own storage medium resources, which is isolated from and not shared by other computers/servers. Storage resources are tremendously wasted, as merely 50-60% of the capacity is actually used. In the present invention, all the isolated SMRs are aggregated to a single unit, which is centrally managed and serves as one logic SMR for users. Users may regard the aggregated SMRs as an “unlimited” storage pool, in order to meet their ever-increasing demand for more storage resources. The present invention saves storage resources and increases efficiency of usage of storage resources.

Detailed Description of the Present Invention

In this embodiment, a SMRMC has 2 logic hard disks C: and D:. The detailed steps are:

- 1) The administrator uses a formatted NTFS local disk D: as a VSMA ;
- 2) The administrator registers SMRs in the network on the SMRMC, wherein the contents to be registered includes: Name of the SMR, Description of the SMR, Storage Path of the SMR, Username and Password for accessing network resources, Capacity of the SMR, Available Space of the SMR, Type of the SMR, Type of the Network Connection;
- 3) A User registers 2 SMRs, ShareStore and DevStore, on the SMRMC. The contents of the SMR table are shown as following:

Name of the SMR	ShareStore	DevStore
Description	Disk D on the database server	Shared directories on the department server
Storage Path	\dbServer\diskd	\techServer\share
Username	Public	Tech
Password	Public	Tech
Type of the SMR	Disk	Disk Array
Capacity	40GB	400G
Available Space	24G	52G
Type of the Network Connections	100M	100M
Status of Resource Allocation	Allocated	Allocated
Number of Times of Access	200	350
Number of Times of Access	0	3

Failure		
Status of the SMR	Available	Available

ShareStore refers to the shared directories on the host computer of dbServer.

DevStore refers to the shared directory Share on the host computer of techServer.

4) Create a file folder called Mediashare on disk D:, which can be seen in the windows explorer. The system administrator may share this folder and set permissions for users in the network.

5) Allocate ShareStore, which is a SMR registered on the SMRMC, to Mediashare.

6) Set rules according to which the system will transfer files in the Mediashare folder.

7) A user Guest may see the shared directory Mediashare through the network and further acquire full access permission to that directory.

8) The user copies sample_file from its local disk to the Mediashare folder on the SMRMC, where a new file sample_file is created in Mediashare directory.

9) The system, according to the transfer rules set for the Mediashare directory, trims the file, transfers the file to the SMR ShareStore, and then sets Trimming attribute and Network Path attribute of the file; the detailed steps of trimming are:

a) Locating the SMRs which is assigned to the Mediashare directory;

b) Selecting SMRs which are currently available;

c) Selecting SMRs of which available spaces are greater than the size of sample_file;

d) Selectting the SMR ShareStore which has a higher rate of successful access and faster connection speed;

e) Copying sample_file to the ShareStore SMR according to its Storage Path \\dbServer\\diskd;

f) Trimming the local copy of sample_file on the SMRMC, set File Trimming attribute, record the Network Path Flag of the transferred copy of sample_file;

g) Setting Remote Access Flag according to rules set by administrators.

In the above embodiment, a user may access the sample_file stored on the